

LATE ORDOVICIAN GRAPTOLITES FROM THE MALLACOOTA BEDS, EAST GIPPSLAND

By PIERRE DE HEDOUVILLE AND CHRISTOPHER J. L. WILSON

Department of Geology, University of Melbourne, Parkville, Victoria 3052

ABSTRACT: Graptolite faunas have been discovered in slates near Mallacoota. Identifiable species suggest a late Gisbornian age for the Mallacoota beds in this region. The Mallacoota beds therefore accumulated prior to or as contemporaneous lateral facies equivalents of the undifferentiated Late Ordovician turbidite deposits that crop out in the same general region and as the Wagonga beds in southern N.S.W.

The sedimentary sequence cropping out between Eden (N.S.W.) and Mallacoota (Victoria) has been regarded as 'Undifferentiated Ordovician' and Steiner (1966) referred to it as the Mallacoota beds. Similar rocks occur westward (Fig. 1) along the coastal section to Orbost e.g., at Cape Everard (Douglas 1974, Fry & Wilson 1982). The assigning of an Ordovician age to these rocks was based on lithological similarities to sequences that underlie the fossiliferous Ordovician rocks elsewhere in East Gippsland (VandenBerg 1979a, b) and southern N.S.W., with the precise age remaining an enigma (Wilson *et al.* 1982). Graptolites have been reported from Cape Conran and Nowa Nowa with Hall (1899) recording that: 'from Eastern Gippsland, a few forms, also belonging to the Upper Ordovician, have

been doubtfully recorded, the condition of the specimens rendering specific identification impossible although I consider the generic character of the fossils sufficiently clear'.

However, Eaton (1980), during a study of the strongly foliated and metamorphosed sequence at Cape Conran, found no evidence for the existence of graptolites at this locality.

To date, only one graptolite locality has been identified in the Mallacoota beds. In April 1982 graptolites were found by P. de H. in a grey slate bed to the north of Seal Creek at 149°41'7"E, 37°39'16"S (Grid Reference 365278 Mallacoota, 1:100,000 Sheet 8822). At Cape Everard, where there is another portion of the Ordovician sequence, some conodonts have been collected

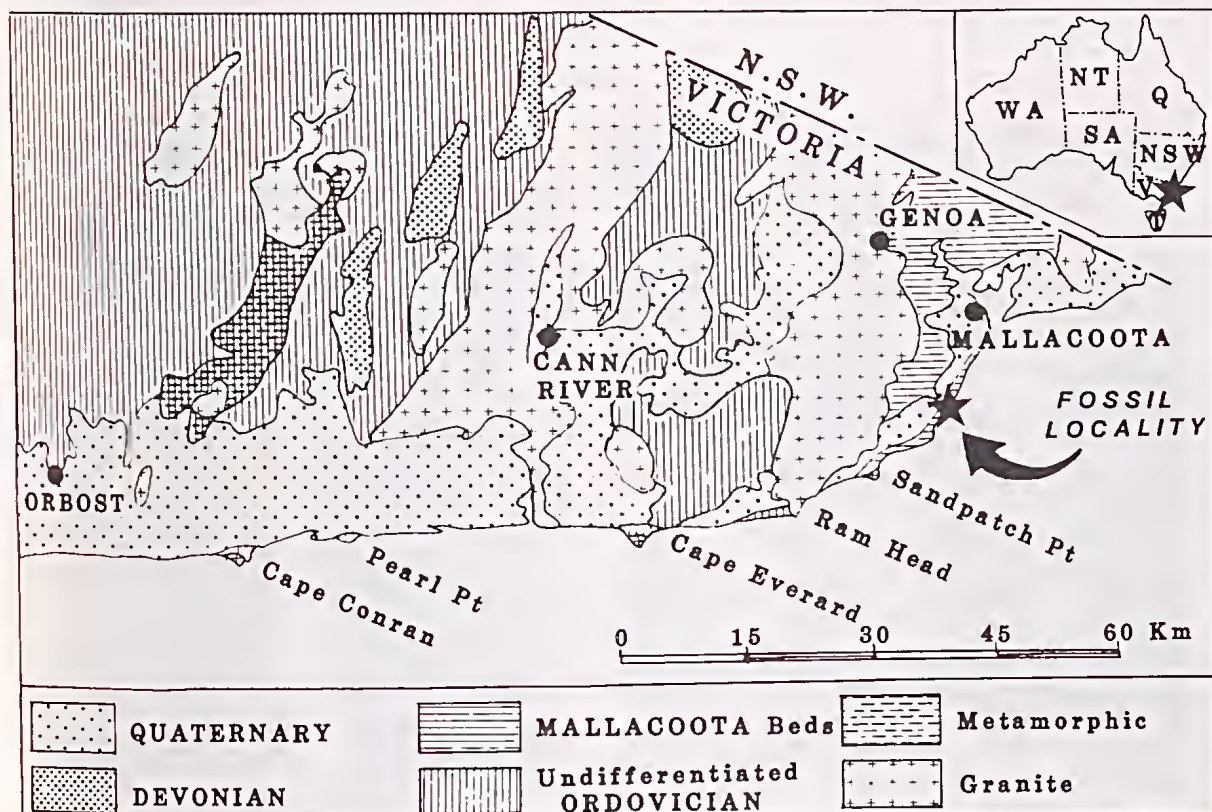


Fig. 1—Locality map adapted from Mallacoota 1:250 000 geological map (Douglas, 1974).

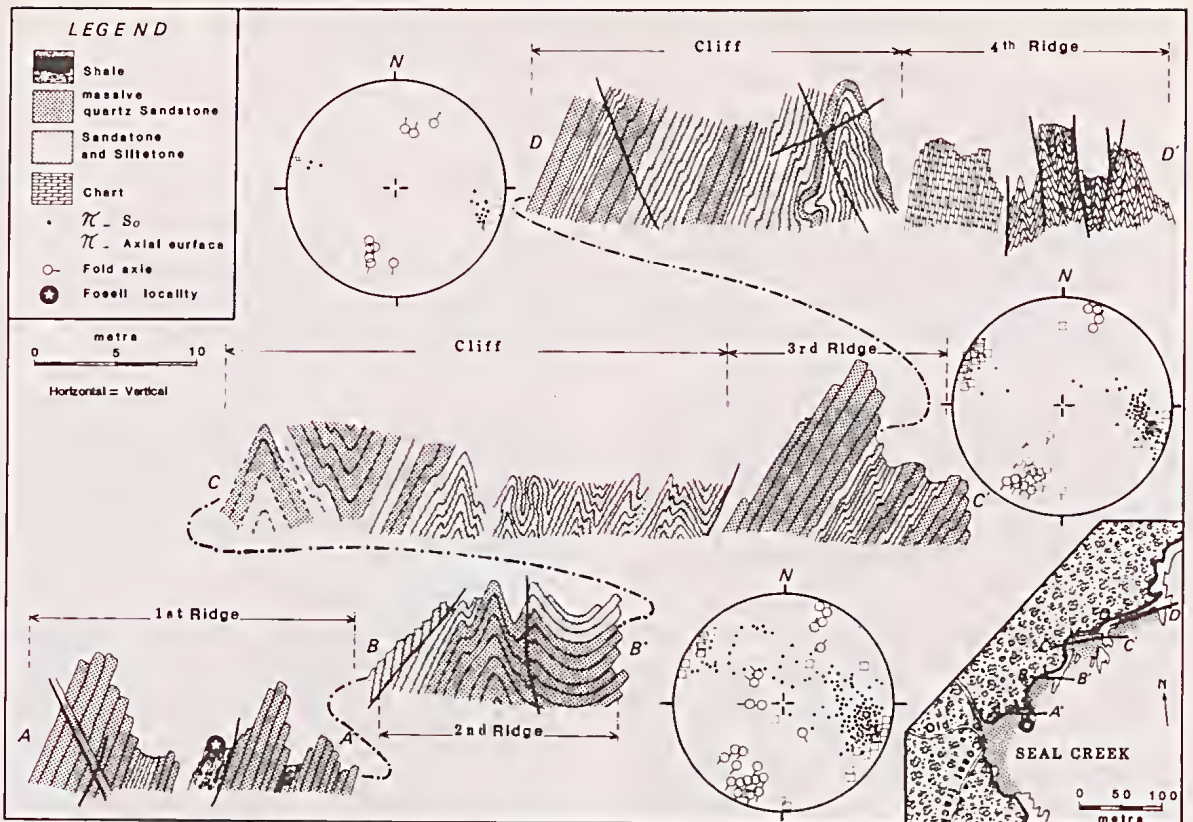


Fig. 2—Geological sections looking north showing the relationship of the graptolite locality to the sedimentary sequence and folding. The stereographic data are poles to bedding, axial surfaces of folds and fold axes, they are positioned adjacent to the section containing the data. Insert shows location of sections.

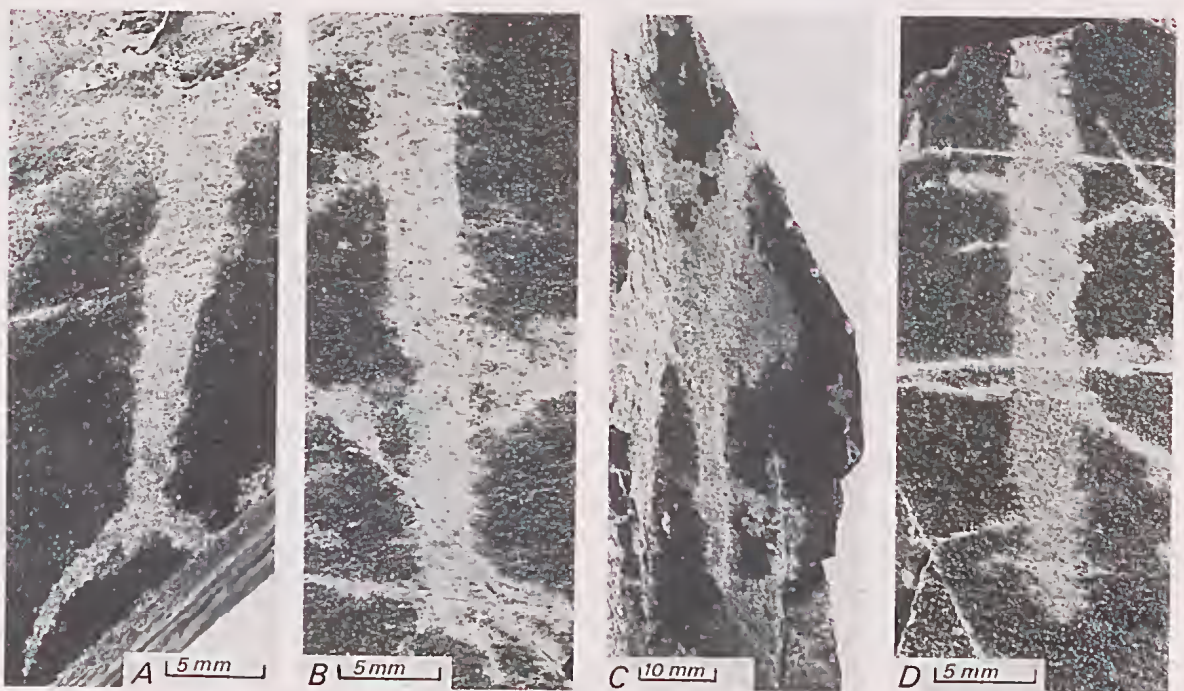


Fig. 3—Graptolites from Seal Creek, south of Mallecoota, Vic. A, B, *Climacograptus bicornis bicornis* (J. Hall). A, MUGDF6129b; B, MUGDF6139; C, *Dicranograptus ramosus* (s.l.) (J. Hall), MUGDF6148b; D, *Orthograptus calcaratus* (s.l.) Lapworth, MUGDF6145.

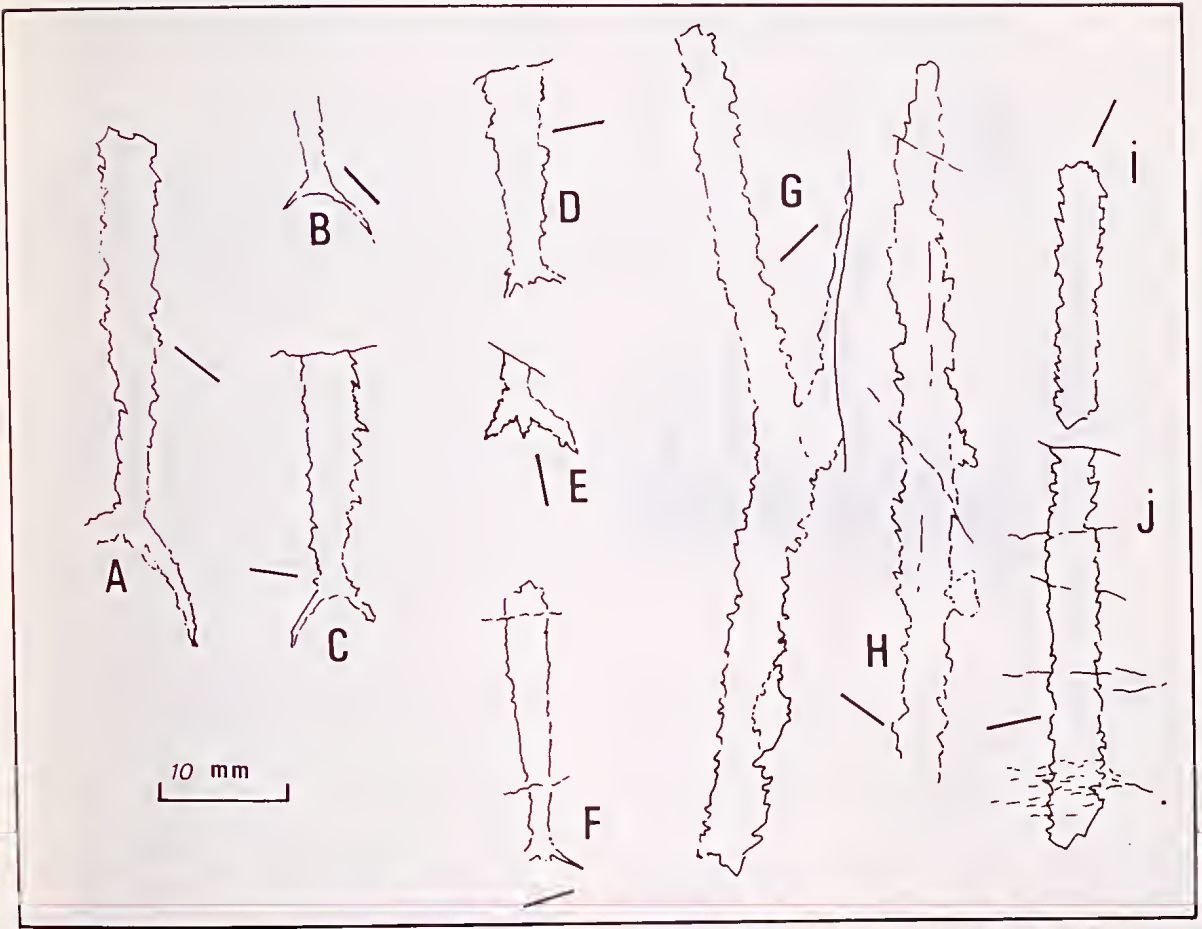


Fig. 4—Graptolites from Seal Creek, south of Mallacoota, Vic. A, B, C, *Climacograptus bicornis bicornis* (J. Hall). A, MUGDF6129a; B, MUGDF6133; C, MUGDF6143; D, E, F, *Climacograptus bicornis tridentatus* Lapworth, D, MUGDF6140; E, MUGDF6144a; F, MUGDF6141; G, H, *Dicranograptus ramosus* (J. Hall); G, MUGDF6148a; H, MUGDF6131a; I, J, *Orthograptus calcaratus* (s.l.) Lapworth, I, MUGDF6154; J, MUGDF6134. Lineation direction on samples shown by short lines.

and identified by I. Stewart (pers. comm. and see VandenBerg 1981); these suggest a Late Ordovician age.

GEOLOGICAL SETTING

The sequence containing the graptolite horizon is illustrated in Fig. 2 and consists of folded sandstones, shales and cherts. It is similar to that described 10 km to the north by Fenton *et al.* (1982), being characterised by turbidites deposited in the mid-fan region of a submarine fan. Three main episodes of deformation accompanied by lower greenschist facies metamorphism have affected the sequence. The structure at Seal Creek (Fig. 2) is dominated by upright folds with subvertical axial surfaces, the majority of the fold axes plunge 20° towards the SSW. In this area there is a slaty cleavage which subparallels bedding. The graptolite locality (Section A-A') lies on the limb of a major asymmetric fold which folds the earliest cleavage and bedding. The graptolites occur in an 80 cm length of a grey shale bed (20 cm thick). The rest of the bed is disturbed by joints, faults and quartz fillings and has yielded no fossils.

THE GRAPTOLITE FAUNA

Approximately 80 graptolite impressions have been found as white phyllosilicate or silvery carbonised films. The state of preservation is generally poor with the graptolites being smeared out and the thecal forms are often not apparent. Two biostratigraphically important species have been identified, namely: *Climacograptus bicornis bicornis* (J. Hall) (Fig. 3A, B, 4A-C) and *Dicranograptus ramosus* (J. Hall) (Fig. 3C, 4G, H). Two other poorly preserved species have been identified: these are *Climacograptus bicornis tridentatus* Lapworth and on the basis of the thecal shape *Orthograptus calcaratus* (subspecies could not be determined).

Three of the identifiable forms are confined to the Late Ordovician (Fig. 5) and have been determined as Gisbornian [Gi(m) or Gi(u)] by reference to the published ranges of VandenBerg (1981) and Thomas (1960). A lower limit for the age is given by the appearance of *C. bicornis bicornis* and *D. ramosus* (Fig. 5). A more restricted age is given by the presence of *C. bicornis tridentatus* and *O. calcaratus*. Therefore an upper age

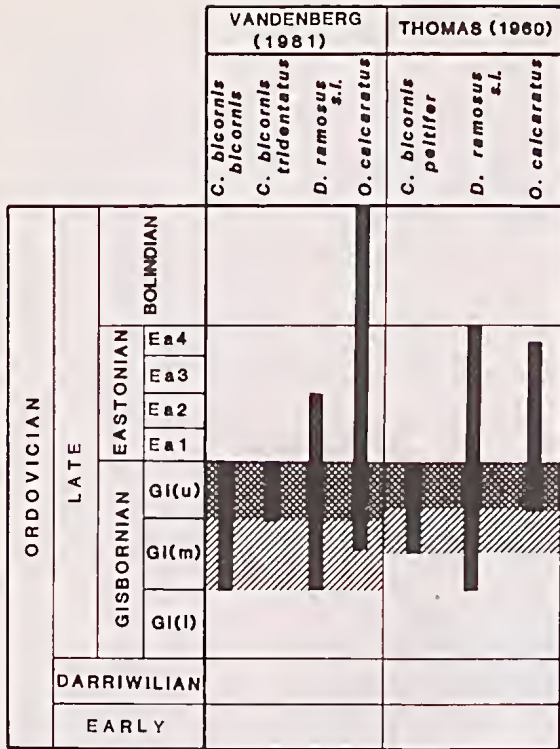


Fig. 5—Age range of graptolites identified at Mallacoota.

for the sequence is the Gisbornian-Eastonian boundary, suggested by the disappearance of *C. bicornis bicornis* and *C. bicornis tridentatus*.

The fossils MUGDF6126a to F6188 are lodged in the F. A. Singleton Museum, Geology Department, University of Melbourne.

CONCLUSIONS

The graptolite faunas suggest that deposition of this part of the Mallacoota beds was during the Gisbornian division of the Late Ordovician, only just older than the Eastonian units in other parts of East Gippsland (VandenBerg 1979a, 1979b, 1981). The deposition of the Mallacoota beds in northeastern Victoria may be con-

temporaneous with parts of the Wagonga beds and other slate and greywacke units in N.S.W. (Jenkins *et al.* 1982).

ACKNOWLEDGEMENTS

We wish to thank the National Parks Service for permission to work in the Croajingalong National Park. We thank N. W. Archbold for his help with specimen photography and O. P. Singleton and A. H. M. VandenBerg for their help in identifying the graptolites.

REFERENCES

- DOUGLAS, J. G., 1974. Explanatory notes on the Mallacoota 1:250 000 geological map. *Rept. geol. Surv. Vict.* 1974/6, 48 p.
- EATON, P. C., 1980. The geology of Cape Conran, East Gippsland, B.Sc. (Hons.) University of Melbourne (unpubl.).
- FENTON, M. W., KEENE, J. B., & WILSON, C. J. L., 1982. The sedimentology and environment of deposition of the Mallacoota Beds, eastern Victoria. *J. geol. Soc. Aust.* 29: 107-114.
- FRY, M. C. & WILSON, C. J. L., 1982. The geology of Cape Everard, Victoria. *Proc. R. Soc. Vict.* 94: 173-181.
- HALL, T. S., 1899. The graptolite-bearing rocks of Victoria, Australia. *Geol. Mag. Dec.* 4, 6: 438-451.
- JENKINS, C. J., KIDD, P. R., & MILLS, K. J., 1982. Upper Ordovician graptolites from the Wagonga Beds near Batemans Bay, New South Wales. *J. geol. Soc. Aust.* 29: 367-373.
- STEINER, J., 1966. Depositional environment of the Devonian rocks of the Eden-Merimbula area, N.S.W. Ph.D. Thesis, ANU (unpubl.).
- THOMAS, D. E., 1960. The zonal distribution of Australian graptolites. *J. Proc. R. Soc. N.S.W.* 94: 1-58.
- VANDENBERG, A. H. M., 1979a. Identifications of Late Ordovician graptolites from the Deddick region, northeastern Victoria. *Rept. geol. Surv. Vic.*, 1979/24. (Unpubl.).
- VANDENBERG, A. H. M., 1979b. Identifications of Late Ordovician graptolites from eastern Victoria. *Rept. geol. Surv. Vic.*, 1979/63. (Unpubl.).
- VANDENBERG, A. H. M., 1981. Victorian stages and graptolite zones. *Inter. Union Geol. Sci. Publ.* 6: 2-7.
- WILSON, C. J. L., HARRIS, L. B., & RICHARDS, A. L., 1982. Structure of the Mallacoota area, Victoria. *J. geol. Soc. Aust.* 29: 91-105.